UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4

Science and Ecosystem Support Division
Field Services Branch
980 College Station Road
Athens, Georgia 30605-2720

April 21, 2016

Mr. John Finke, Director
Metro Public Health Department
Nashville/Davidson County
Pollution Control Division
2500 Charlotte Avenue
Nashville, TN 37209

SESD Project ID: 16-0144

Dear Mr. Finke:

This letter is to forward to you the final report concerning the 2016 Technical Systems Audit (TSA) of the ambient air monitoring program operated by the Metro Public Health Department Pollution Control Division (MPHDPCD). On January 12-15, 2016, EPA Region 4 Science and Ecosystem Support Division (SESD) personnel – Stephanie McCarthy and Keith Harris – conducted the audit. Sara Waterson attended the audit as a representative from the EPA Region 4 Air, Pesticides and Toxics Management Division (APTMD). The data collection period covered by the TSA was January 2013 – December 2015.

SESD is requesting your agency develop a plan to address the issues identified in this TSA report. Please respond back to us within 30 days. If you have any questions regarding the attached audit report, please contact Stephanie McCarthy of my staff at (706) 355-8745.

Sincerely,

John Deatrick

John Deatrick, Chief
Field Services Branch

Enclosure

cc (by email): Erin Jackson, MPHDPCD

United States Environmental Protection Agency
Region 4
Science and Ecosystem Support Division
980 College Station Road
Athens, Georgia 30605-2720

2016 Technical Systems Audit Report

Metro Public Health Department Nashville/Davidson County, Pollution Control Division
Ambient Air Monitoring Program

Nashville, TN
Audit Conducted January 12-15, 2016

SESD Project Identification Number: 16-0144

Project Leader: Stephanie B. McCarthy
U.S. EPA R4/SESD/FSB/SAS
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Title and Approval Sheet

Title: **2016 Technical Systems Audit Report – Metro Public Health Department Nashville/Davidson County**

FINAL REPORT

Approving Official:

Laura Acke 04/21/16

Laura Ackerman, Chief — Date
Superfund and Air Section
Field Services Branch

SESD Project Leader:

Stephanie B. McCarthy 4-21-16

Stephanie B. McCarthy, Physical Scientist — Date
Superfund and Air Section
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1.0 Executive Summary

Environmental Protection Agency (EPA) Region 4 Science & Ecosystem Support Division (SESD) personnel conducted a Technical Systems Audit (TSA) of the Nashville/Davidson County Metro Public Health Department Pollution Control Division (MPHDPCD) ambient air monitoring program in January 2016. The purpose of the TSA was to evaluate the operation and performance of the MPHDPCD air monitoring program, pursuant to 40 CFR Part 58, Appendix A, Section 2.5. Data from the 2013-2015 calendar years were reviewed during the TSA.

MPHDPCD operates a sizeable ambient air monitoring network consisting of seven monitoring stations and a PM_{10} gravimetric laboratory. During the TSA, five air monitoring stations were inspected. The PM_{10} laboratory was audited as well; a weighing session by the lab analyst/field technician was observed during the audit. MPHDPCD staff demonstrated technical expertise in operating and maintaining air monitoring equipment.

The MPHDPCD has implemented numerous upgrades and enhancements to its ambient monitoring program in the past three years, which has resulted in marked improvements to the agency's quality system. However, areas where further improvement is needed were observed. The findings and recommendations of this TSA indicate a need for increased attention and resources directed towards the quality assurance components of the MPHDPCD monitoring program. Agency SOPs are in need of immediate revision. Records consolidation is needed to simplify and improve efficiency in the data verification/validation processes. Towards that end, digitizing records would benefit the agency long-term.

2.0 Introduction

On January 12-15, 2016, EPA Region 4 SESD personnel conducted a TSA of the MPHDPCD ambient air monitoring program. The audit team included Stephanie McCarthy (lead auditor) and Keith Harris from SESD's Field Services Branch, Superfund & Air Section. Sara Waterson attended the audit as a representative from the EPA Region 4 Air, Pesticides and Toxics Management Division (APTMD).

The purpose of the audit was to assess the MPHDPCD's compliance with established regulations governing the collection, analysis, validation, and reporting of ambient air quality data. Pursuant to 40 CFR Part 58, Appendix A, Section 2.5, TSAs are required to be conducted every three years. Data reviewed as part of this TSA included that generated during the 2013-2015 calendar years. Data was queried from EPA's Air Quality System (AQS) database prior to the on-site audit. SESD's Ambient Air Monitoring Technical Systems Audit Form was completed by MPHDPCD staff prior to the on-site audit and is included as Appendix A of this report.

The audit included a review of data, recordkeeping, documentation, and support facilities housed at the MPHDPCD central office, located at 2500 Charlotte Avenue, in Nashville, Tennessee. Five of the seven monitoring stations operated by MPHDPCD were visited during the audit as well. The five MPHDPCD air monitoring stations visited during the audit are listed below.

Common Site Name	AQS Identification
Percy Priest Dam	47-037-0026
East Health Center	47-037-0011
Lockeland	47-037-0023
Trevecca	47-037-0002
Near Road	47-037-0040

During the audit, the following MPHDPCD personnel were interviewed.

- John Finke, Director
- Erin Jackson, Program Manager
- Tiffany Lanh, Quality Assurance Technician/AQS Submitter
- Greg Lowery, Field Technician/Laboratory Analyst
- Scott Lough, Field Technician

The following AQS reports were reviewed in preparation for this TSA.

- AMP 251: QA Raw Assessment Report (2013-2015)
- AMP 256: QA Data Quality Indicator Report (2013-2015)
- AMP 350: Raw Data Report (2013-2015)
- AMP 430: Data Completeness Report (2013-2015)
- AMP 480: Design Value Report (2015)

- AMP 501: Extract Raw Data 5-minute SO_2 (2013-2015)
- AMP 600: Certification Evaluation and Concurrence (2013-2015)

Additionally, the following MPHDPCD documents were reviewed.

- *MPHDPCD's Quality Assurance Project Plan (QAPP) for Ambient Air Quality Monitoring of Criteria Pollutants, October 11, 2006.*
- *MPHDPCD's QAPP for Ambient Air Quality Monitoring of Criteria Pollutants, December 7, 2015.*
- *MPHDPCD Standard Operating Procedures (SOP) for Thermo 49C Ozone Analyzer, Policy No. AP-LAB-3-C, Revision 1, April 6, 1999.*
- *MPHDPCD SOP for the Determination of $PM_{2.5}$, Policy No. AP-LAB-14, Revision 4, December 30, 2003.*
- *MPHDPCD SOP for the Determination of PM_{10} by SSI Method, Policy No. AP-LAB-13, Revision 2, September 14, 2007.*
- *MPHDPCD SOP for Dasibi 4108 Sulfur Dioxide Analyzer, Policy No. AP-LAB-1, Revision 1, April 6, 1999.*
- *MPHDPCD SOP for Thermo 48C Carbon Monoxide Analyzer, Policy No. AP-LAB-2, Revision 1, April 6, 1999.*
- *MPHDPCD SOP for Thermo 42C NO-NO2-NOx Analyzer, Policy No. AP-LAB-2, Revision 1, April 6, 1999.*
- *Nashville Local Program Ambient Monitoring Plan Submittal (excerpt from the 2015 State of Tennessee Annual Monitoring Network Plan).*

3.0 Commendations

MPHDPCD staff interviewed by SESD auditors during this TSA appeared proficient in and knowledgeable of their roles and responsibilities. The MPHDPCD staff demonstrated technical knowledge in operating, maintaining, and calibrating instrumentation. Staff (including the program manager) are cross-trained and serve as back-up to each other on the different technical aspects of the monitoring program. The MPHDPCD is unique in that the agency director is also proficient in the technical components of the ambient air monitoring program and can back-up field technicians during times of need.

The MPHDPCD has made numerous changes and enhancements to its ambient air monitoring program in the past three years, some of which stemmed from corrective actions implemented as a result of the 2013 TSA. These improvements should enhance the agency's long-term data capture, as well as bolster data quality. Examples of the improvements include the following:

- All field instruments have been replaced;
- Safety issues at sites have been addressed;
- EDAS data acquisition software has been upgraded to AirVision software;

- Polling capabilities have been upgraded from analog to digital;
- Equipment has been purchased for purposes of implementing internal performance audits;
- A new employee has been hired, whose responsibilities include AQS administration and quality assurance;
- New equipment has been obtained for the PM_{10} gravimetric laboratory;
- Logbook documentation has improved, especially in the PM_{10} laboratory; and,
- Improvements have been made to the agency's Excel data forms.

In addition to the upgrades and enhancements enumerated above, SESD notes a recent accomplishment specifically observed during the TSA. In preparation for this audit, SESD auditors generated multiple AQS data reports approximately 5 weeks prior to the on-site visit. In reviewing the data reports, SESD auditors noted numerous data points that appeared to be outliers warranting further investigation. However, the majority of these data that appeared anomalous during pre-audit activities were found to be successfully corrected by the time of the TSA. The necessary corrections were made by the aforementioned new employee hired to oversee AQS activities. While assisting staff with finalizing the corrective actions needed as a result of the 2013 TSA, the new hire identified many of the issues within the MPHDPCD 2013-2015 data set and amended them appropriately in AQS.

4.0 Findings and Recommendations

The observations from this TSA were compared to EPA regulations, technical policies and guidance, and the MPHDPCD quality system documentation.

Quality system deviations found through this TSA are classified into three categories: **Findings**, **Concerns**, and **Observations**. These quality system deviations are defined as follows:

Finding:	Departure from or absence of a specified requirement (regulatory, QMP, QAPP, SOP, etc.) or guidance deviation which could significantly impact data quality.
Concern:	Practices thought to have potential detrimental effect on the ambient air monitoring program's operational effectiveness or the quality of sampling or measurement results.
Observation:	An infrequent deviation, error, or omission which does not impact the output of the quality of the work product, but may impact the record for future reference.

For each of these categories, corrective action recommendations are provided. Corrective actions are required for all quality system deviations ranked as **Findings** or **Concerns**. Depending on the severity of the deviation, a specific data deliverable(s) may be requested to show that the corrective action recommendation has been successfully implemented. In these cases, the TSA report will specify the

deliverable(s) that will be required for AQS and/or submitted to SESD. **Observations** do not require corrective actions.

4.1 FIELD OPERATIONS

4.1.1 **Concern:** Obstructions may be impacting the probe systems at the Trevecca, Near-Road, and East Health Center sites.

Discussion: Siting evaluations are an important quality assurance assessment, designed to ensure monitoring sites operate in compliance with regulatory requirements. MPHDPCD staff have recently reinstated annual siting evaluations of the monitoring network, which is an improvement to the agency's quality system. At the time of this audit, 2015 siting evaluations had been completed by MPHDPCD staff, but the results of the reviews had not yet been verified by the Program Manager.

While visiting the MPHDPCD monitoring stations, SESD auditors observed trees (without foliage) encroaching the probe systems at the Near-Road and East Health Center sites. 40 CFR Part 58, Appendix E, Section 5(a) requires that inlets be 10 meters or more from the drip-line of trees. Vegetation can have a scavenging effect on pollutants and, resultantly, negatively impact the data collected by nearby samplers. Trees can also act as obstructions in cases where they are located between the air pollutant sources or source areas and the monitoring site, and where the trees are of a sufficient height and leaf canopy density to interfere with the normal airflow around the probe or inlet.

At the Trevecca site, MPHDPCD staff had previously determined nearby trees were acting as obstructions; those trees had been trimmed the week prior to this TSA. However, the concern noted by SESD auditors at this site was the 3-story building adjacent to the building upon which the PM_{10} sampler was positioned. 40 CFR Part 58, Appendix E requires unrestricted airflow 270 degrees around the probe or sampler. Section 4(a) of Appendix E further requires the distance from the obstacle to the probe/inlet be at least twice the height that the obstacle protrudes above the probe or inlet. The PM_{10} sampler may be too close to the 3-story building; the building may be prohibiting air flow in a continuous 270-degree arc, and thus acting as an obstruction.

Recommendation: Siting evaluations should be conducted in the spring or summer of each year, when trees and vegetation are in their peak seasons. With that in mind, MPHDPCD staff should reevaluate siting at these three monitoring stations in the spring to more accurately determine whether or not the sites meet Appendix E requirements. At the Near-Road and East Health Center sites, the trees may need to be trimmed if it is determined that the drip-line of the trees is less than 10 meters from the sampling probes. At the Trevecca site, however, MPHDPCD may need to request a siting waiver to APTMD, pursuant to 40 CFR Part 58, Appendix E, Section 10, if the 3-story building is determined to be an obstruction.

Additionally, SESD recommends that the measurements taken during the Appendix E evaluations for these three sites, as well as all sites in the MPHDPCD network, be entered into the MPHDPCD's annual network plan as evidence that the sites meet Appendix E requirements, in accordance with 40 CFR 58.10(a).

4.1.2 **Concern:** Field equipment has not been programmed to perform automated zero, precision, or span cycles (i.e., quality control (QC) checks).

Discussion: 40 CFR Part 58, Appendix A requires 1-point QC (i.e., precision) checks to be conducted every two weeks for each analyzer used to collect ozone, carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) data. In the MPHDPCD network, these required QC checks are performed manually; agency staff travel to the field sites every two weeks to test the analyzers. When reviewing the MPHDPCD 2013-2015 data set, SESD auditors observed that the majority of the required QC checks were conducted every two weeks; however, some instances of QC checks conducted beyond the 14-day criterion were observed.

Conducting manual QC checks is acceptable. However, automation would allow MPHDPCD staff to generate daily zero/precision/span cycles, which would make available more QC data against which routine concentrations could be validated. In the current MPHDPCD system, if a biweekly precision check fails, routine data is invalidated back to the last acceptable check – which is usually 2 weeks prior. However, with automation, data may only need to be invalidated back to the last acceptable daily check – which could save a substantial amount of data. Additionally, automation would guarantee QC checks to be conducted within the regulatory time frames.

MPHDPCD has recently upgraded its gaseous pollutant analyzers, as well as converted from analog to digital communications. With these enhancements, the equipment and data acquisition system in place in the MPHDPCD network has the ability to perform automated QC checks, if programmed accordingly.

Recommendation: SESD recommends MPHDPCD program its monitoring equipment to conduct automated QC checks. Although the initial programming of the automation may be time consuming, the upgrade can save personnel substantial time and resources in the long term, while simultaneously bolstering data quality.

4.1.3 **Observation:** Unused and/or uncapped lines were observed in the field.

Discussion: While visiting the Percy Priest ozone site, a disconnected calibration line was observed within the shelter. The ozone analyzer was not collecting ambient data at the time of this January TSA. However, the analyzer was operational and had been recently used to conduct hands-on testing of the ozone SOP under revision.

At the Near-Road site, SESD auditors observed an uncapped cylinder line that was not in use, but was still plumbed as if it could be. At the East Health Center site, an unused, uncapped audit line was also observed within the shelter.

Uncapped sample lines can collect dust, debris, and insects from inside the monitoring station. Therefore, in order to prevent contamination, all sample lines in the shelter should be capped when not in use. Moreover, if a sample line is no longer needed, it should be removed from the sampling train. Unused sample lines that remain in a shelter could be accidentally mistaken for viable lines, and erroneously connected to monitoring equipment. If unclean, the use of these lines could result in subsequent data loss.

Recommendation: MPHDPCD staff should remove sample lines that are no longer viable, and/or cap those that are not used on a routine basis. MPHDPCD staff should inspect sample lines during each site visit to ensure they are clean, condensation-free, and capped (if needed).

4.1.4 **Observation:** Some logbook documentation lacked detail and/or did not adhere to best practice protocols.

Discussion: During the TSA, logbook records were reviewed while visiting field sites and also while reviewing data at the central office. SESD auditors observed large blank spaces on a few pages within the field logbooks. Auditors also observed some instances where the entries were dated, but not signed or initialed by the operator.

In addition, SESD auditors observed multiple instances where documentation of performance audit results lacked labeling and appropriate identifiers in the field logbooks. The entries appeared primarily as a series of numbers, which were difficult to interpret by the SESD auditors.

Recommendation: In keeping with documentation best practices, SESD recommends field technicians place an 'X' in any blank spaces in logbooks in order to maintain transparency as well as prevent backfilling. SESD also recommends that all logbook entries be initialed or signed. SESD further encourages MPHDPCD staff to request that any third-party auditor document the logbook clearly, with appropriate labeling and identifiers, such that the results can be easily interpreted and understood by any reader.

4.1.5 **Observation:** The results of performance acceptance testing are not fully documented.

Discussion: Performance acceptance testing is an important activity to ensure newly purchased equipment functions correctly and is capable of producing reliable measurements. During this TSA, MPHDPCD staff indicated that they had recently begun documenting their in-house performance acceptance testing and post-repair performance checks, which is an improvement to the agency's quality system. However, the full results of the performance testing are not consistently documented. For example, the results of a precision check following a flow

adjustment may not always be recorded. In order to demonstrate the full history of equipment performance, as well as track and analyze performance trends, the results of all QC checks and diagnostic tests should be documented.

Recommendation: MPHDPCD should take credit for the in-house testing conducted on new and repaired equipment by keeping complete records of all procedures and QC checks. SESD encourages MPHDPCD to develop a spreadsheet or database to formally track and document instrument repair and testing.

4.2 LABORATORY OPERATIONS

4.2.1 Finding: MPHDPCD staff are not verifying the relative humidity (RH) sensor in the PM_{10} laboratory every six months, in accordance with the MPHDPCD PM_{10} SOP (Policy Number AP-LAB-13).

Discussion: MPHDPCD uses an ExTech hygro-thermometer (i.e., temperature/RH sensor) in the PM_{10} gravimetric laboratory. The laboratory RH sensor is required to be checked every 6 months, per Section VIII (E) of the agency's PM_{10} SOP. However, during the TSA, SESD auditors learned that this semi-annual verification does not occur.

The semi-annual verification of laboratory RH and temperature sensors is recommended in the EPA *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II* (QA Handbook). Please see Appendix D of the 2013 QA Handbook for more information. The PM_{10} regulatory method (40 CFR Part 50, Appendix J) requires PM_{10} filter conditioning within specified temperature and RH ranges. With that in mind, it is important that the temperature/ RH sensor in the gravimetric laboratory be verified on a routine basis in order to ensure the sensor is working properly and collecting quality data. Although the ExTech hygro-thermometer is calibrated/certified by the vendor on an annual basis, the sensor should be verified in-house with an independent standard on a more frequent basis (i.e., every 6 months) as a quality assurance check.

Recommendation: MPHDPCD should resume conducting semi-annual verifications of the RH sensor in the gravimetric laboratory, in accordance with the agency's SOP. The temperature sensor should be verified on a semi-annual basis as well.

4.2.2 Concern: Logbooks documenting PM_{10} filter weighing activities contain filter conditioning dates, but not filter conditioning times.

Discussion: Documentation of PM_{10} filter weighing activities has significantly improved since the 2013 TSA. MPHDPCD currently maintains two laboratory logbooks, in an effort to capture the many laboratory elements that must be recorded. One such item is the filter conditioning

period. 40 CFR Part 50, Appendix J, Section 9.3 requires at least 24 hours for the equilibration of each PM_{10} filter. To document this requirement, MPHDPCD staff record the beginning/ending dates of the filter conditioning periods in the laboratory logbooks. However, the times of these events are not recorded along with the dates. SESD auditors spot-checked PM_{10} logbook records across the three-year period covered by this TSA. The majority of filter records reviewed indicated that filters conditioned for longer than the requisite 24 hours. However, the auditors did observe a few entries where the documented ending date was the day following the beginning date. For those entries, without the precise times recorded, the SESD auditors could not verify that the filters had equilibrated for a minimum of 24 hours. This gray area in the documentation presents a vulnerability to the agency's PM_{10} data set.

Recommendation: Documentation of filter conditioning should be expanded to include conditioning times. The logbook information should clearly indicate the time/date the filter conditioning period began, as well as the time/date the conditioning period ended. Such enhancements would more clearly convey that the specific conditioning period requirements of 40 CFR Part 50, Appendix J, Section 9.3 were satisfied.

4.2.3 **Concern:** Logbook entries do not clearly indicate if all required elements pass or fail the PM_{10} filter weighing acceptance criteria.

Discussion: As stated in Concern 4.2.2 above, documentation of PM_{10} filter weighing activities has been expanded since the last TSA; entries for each weighing event span across columns in two logbooks. These laboratory logbooks contain the majority of the necessary elements required for successful PM_{10} data validation. For example, logbooks contain columns for such information as laboratory temperature, RH, and balance QC checks using mass reference standards. However, the logbooks do not have columns/information that clearly indicate whether the required QC elements passed or failed their respective acceptance criteria.

SESD auditors observed a weigh session during the TSA, which included watching the analyst document the laboratory logbooks. For the majority of the QC elements, the analyst would document the pertinent information obtained during the weigh session, but would then mentally calculate whether the elements passed or failed their respective acceptance criteria. SESD auditors discussed this observation with the analyst during the weigh session. The analyst and SESD auditors concurred that the laboratory logbooks, in their current format, do not have space available to add columns to document the mathematical computations. A third laboratory logbook would be needed in order to legibly document the additional QC information (as well as the conditioning times detailed in Concern 4.2.2 above). Although managing three logbooks in the laboratory would be acceptable, it could make the data validation process more cumbersome and time-consuming.

Recommendation: Calculated results of laboratory QC checks should be clearly documented so that any data reviewer can easily determine whether or not the QC checks passed or failed. To that end, SESD recommends that MPHDPCD develop a mechanism that will streamline the filter weighing documentation. SESD encourages MPHDPCD to consider developing an Excel

spreadsheet and/or Access database for use in the gravimetric laboratory. The use of a spreadsheet or database would provide the necessary space for capturing all of the required QA/QC elements, as well as allow for the programming of mathematical formulas and acceptance limits. In that manner, the spreadsheet or database could immediately alert the analyst if any QC element did not pass its acceptance criterion, or if any certified standard in use in the laboratory was nearing its expiration. This, in turn, would augment the agency's quality system and simplify the data review process for agency staff.

4.3 RECORDS MANAGEMENT

4.3.1 **Concern**: The local area network (LAN) share drive for electronic records is not adequately secured.

Discussion: On the MPHDPCD LAN, there is a share drive folder (S: Air Pollution) that serves as the final repository for ambient air monitoring files. However, that folder is not locked: all air monitoring staff have the ability to delete or edit files that have been uploaded to the share drive. This lack of security is a vulnerability to the agency, because staff could inadvertently modify or delete information within the folder.

Recommendation: The MPHDPCD air monitoring share drive folder (S: Air Pollution) should be locked in such a manner that modifications cannot be made to any files without permission from a designated administrator (for example, the air program manager). SESD suggests that the share drive be configured such that all air monitoring staff have "read access" to the folder, as well as the ability to "add" files to the folder. However, "write" and "delete" access should be restricted to only a designated administrator.

4.3.2 **Concern:** No formal records of field technician (personnel) training were observed.

Discussion: MPHDPCD provides on-the-job training (OJT) to field technicians. Additionally, MPHDPCD has provided opportunities for field staff to attend vendor-provided equipment training, which is commendable. MPHDPCD maintains a spreadsheet that tracks training courses completed by staff. However, the spreadsheet does not contain a specific training plan for each monitoring position, enumerating the specific QA and technical courses needed. The spreadsheet does not link to copies of certificates of completion or other documents that would demonstrate successful completion of required courses.

Recommendation: MPHDPCD should formally document their training activities, taking credit for the OJT and vendor-supplied training provided to staff. Additionally, individual training plans should be created for each air monitoring position which define specific courses and training required to be completed before the employee is considered competent in their assigned roles. SESD further recommends that certificates of completion, indicating when staff successfully complete each training/course, be retained with the training plan. Training records will benefit

MPHDPCD by providing additional confidence in the quality and defensibility of the data sets produced by the agency.

4.3.3 **Observation:** MPHDPCD maintains hardcopy certification records, but does not track the certifications using a spreadsheet or similar mechanism.

Discussion: MPHDPCD staff certify standards used in the air monitoring network on an annual basis. The records documenting those certifications are maintained in multiple binders/files within the central office. Filing these hardcopy records in binders/files is acceptable. However, SESD auditors noted a few instances during the TSA where specific records were difficult to locate, given the organization of the files.

When discussing the certification of standards, SESD auditors learned that a master spreadsheet and/or listing of all MPHDPCD primary and transfer standards (and their certification/expiration dates) was not compiled and maintained. A list of the flow standards in use in the network was available in the binder with the flow standard certification records; a similar list(s) was not observed within the binders for the other standards (e.g., photometers, mass flow controllers, mass reference standards). Tracking the completion of the annual certifications can become time-consuming and difficult if a master record is not maintained that accounts for every standard in the network.

Recommendation: MPHDPCD could develop a mechanism to actively track all standards used in the monitoring network. An Excel form, Access database, or similar tool could be developed where this information can be easily maintained in one location and quickly queried. Moreover, programs such as Excel will allow formatting so that reminders can be created to notify users when an expiration is imminent. As the MPHDPCD monitoring network expands in the future, an electronic means to track standards will become more valuable.

SESD further suggests that the tracking of standards' certifications be the responsibility of a single individual within the agency, ideally a quality assurance officer.

4.4 DATA MANAGEMENT

4.4.1 **Finding:** Ambient data was not invalidated when its associated QA/QC check did not meet established acceptance limits.

Discussion: Upon review of the 2013-2015 data set, SESD auditors found a few instances where a QC check failed – but the associated ambient data was not invalidated. For example, on July 22, 2013, the NO_2 analyzer at the East Health Center failed a precision check at 29.4% difference (the acceptance criterion is ±15% difference). Documentation of this issue showed that excessive water was found in the sample line of the analyzer, which in turn caused the instrument to malfunction. The AQS AMP 350 (Raw Data Report) indicated that NO_2 data was invalidated from the time of the malfunction forward until a new instrument was installed and calibrated. However, data was

not invalidated back to the last known date/time when the instrument was operating properly – which would have been the precision check conducted on July 17.

As another example, a similar issue occurred with the ozone analyzer at this site during this same time period. Water in the sample line was detected on July 18; the analyzer malfunctioned and failed its precision check. The subsequent calibration attempt on July 19 produced failing results (10% difference). Corrective action measures were taken and the instrument passed a precision check on July 22. Like the NO_2 issue, data was not invalidated back to the last acceptable QC check conducted on July 12. However, unlike the NO_2 example, ozone data was reported as valid after the failed calibration attempt on July 19. Upon review of the available documentation, SESD auditors and MPHDPCD staff concurred that ozone data following the July 19 calibration should not have been reported to AQS.

A third example was with SO_2 data at the East Health Center in December 2014. An audit failed on December 2, and data was appropriately coded AS (i.e., poor quality assurance results) following the audit until the instrument was recalibrated on December 4. However, the ambient data prior to the failed audit remained in AQS. Upon review of the documentation in-house, SESD auditors and MPHDPCD staff concurred that the data should have been invalidated back to the last acceptable QC check, which occurred on November 20.

Recommendation: MPHDPCD must correct the AQS reporting errors that were identified during the TSA. Additionally, MPHDPCD must augment its data verification/validation process to ensure that ambient data associated with failed QC checks are appropriately invalidated in AQS. The EPA QA Handbook (May 2013) provides guidance on data handling techniques and procedures. SESD recommends MPHDPCD implement additional peer-review of routine concentration data in combination with the associated QA/QC data, ideally by a designated quality assurance officer. Additionally, a Data Handling SOP should be developed that defines when and how to invalidate data, providing specific examples on how to bracket the data such that its quality is defensible.

4.4.2 Finding: The results of invalid precision checks were reported to AQS.

Discussion: In preparation for this TSA, SESD auditors reviewed the AQS AMP 251 (QA Raw Assessment Report) for the MPHDPCD 2013-2015 data set, which summarizes the results of QA/QC checks. On this report, SESD auditors observed numerous QC checks that exceeded the agency's established acceptance criteria. SESD auditors spot-checked a portion of these QC checks during the TSA. Upon review of the MPHDPCD in-house documentation, SESD determined that many of these precision checks were not valid checks, and therefore should not have been uploaded to AQS. Finding 4.4.1 above provides one such example: the 29.4% difference NO_2 precision check reported to AQS represents the extent to which an instrument malfunction was impacting the analyzer (as opposed to a QC check conducted on a properly functioning analyzer, operating in its normal sampling mode).

SESD auditors also spot-checked the AQS AMP 350 (Raw Data Report) for the 2013-2015 data set, in conjunction with the above-mentioned AMP 251. SESD auditors observed several instances where QC results were reported on the AMP 251, but the AMP 350 for the corresponding monitor showed invalid data (i.e., null value codes). For example, the NO_2 monitor at the East Health Center had issues with a flow transducer during August – September 2014. All of the ambient data over the 4-week period was invalidated due to the instrument malfunction; however, three precision checks during that time period were reported to AQS as valid. When ambient data is invalidated in AQS, any associated QC checks must be removed.

Recommendation: In accordance with 40 CFR Part 58, Appendix A, Section 5.1.1, only the results of valid QC checks are to be entered into AQS. This reporting rule was discussed with MPHDPCD staff during the audit. The results of the invalid QC checks identified during the TSA should be removed. SESD further recommends that MPHDPCD staff review the results of all QC checks prior to AQS submittal, in order to ensure only valid QC checks associated with valid data are uploaded.

4.4.3 Finding: Concentration data were missing in AQS for both gaseous and particulate pollutants.

Discussion: During a review of the AMP 350 report for the 2013-2015 time period, multiple data gaps (i.e., missing concentrations) were observed. For example, at the East Health Center site, there was no concentration data reported for the ozone analyzer during the *0200* hour on October 2, 2014. Similarly, there was no concentration data reported for the NO_2 analyzer at the Near-Road site on February 11, 2015, during the *0500-0700* hours. There were no particulate sample concentrations reported for the Lockeland collocated $PM_{2.5}$ sampler during March 2013. For this same sampler, concentration data appeared to be reported on the wrong days during the November – December 2014 time period, which produced "gaps" in AQS.

For all hours or days for which samples are expected to be collected, either a concentration or null value code must be entered into AQS. Data gaps in AQS reports will negatively impact data completeness calculations.

Recommendation: The missing data for the above-mentioned sites/samples should be entered into AQS, if available, or null value codes should be applied. This finding demonstrates the need for increased resources to be dedicated to data verification and validation procedures. MPHDPCD should develop a standardized data handling process (SOP) that includes a final review of the data after it has been submitted to AQS.

4.4.4 **Concern:** Typographical errors were observed in precision and accuracy data entered into AQS.

Discussion: As stated in Finding 4.4.2 above, when reviewing the AMP 251 report in preparation of this audit, SESD auditors noted multiple QA/QC checks that appeared to have exceeded acceptance criteria. For example, the flow rate verification at the Trevecca PM_{10} site on December 17, 2014, appeared to have significantly failed at 68.4% difference. This flow rate verification

was investigated during the TSA. After reviewing the in-house documentation, it was determined that the flow verification passed. The results reported to AQS contained typographical errors: the concentration reported as 73.83 ft^3/minute should have been 43.03 ft^3/minute. Therefore, the percent difference of this flow verification was approximately 1.9% difference (as opposed to 68.4%). Similar typographical errors were observed in the accuracy (i.e., audit) data reported for the agency. For example, an audit at the Hume Fogg CO site on December 6, 2013, appeared to have failed. Data results at one concentration level were reported at 45.2% difference. However, the results reported to AQS contained typographical errors: the concentration reported as 0.310 ppm should have been 0.412 ppm.

MPHDPCD staff manually type precision and accuracy data in preparation for transfer into the AQS database. Typographical errors, such as these examples, can significantly impact the precision and bias statistics that are computed annually as part of the data certification process. At the time of this audit, MPHDPCD staff indicated that independent review of data manually entered into AQS was limited.

Recommendation: The erroneous precision and accuracy data identified during this TSA needs to be modified in AQS. Moreover, for any data that is manually entered, it is critical that an independent reviewer verify each prepared data set in order to minimize typographical errors. SESD recommends MPHDPCD formally implement a second level of data review to verify any data that is manually transcribed, such as the precision and accuracy data set. The data review activities should be detailed in a Data Handling SOP.

4.4.5 Concern: Inconsistencies in data coding were observed in the MPHDPCD 2013-2015 data set.

Discussion: Overall, the null data coding performed by the MPHDPCD is satisfactory and appears to adequately reflect the procedures conducted. However, when reviewing the MPHDPCD data in AQS, SESD auditors observed some inconsistencies in the application of null value codes (i.e., AQS codes used to explain the reasons for invalid or missing data). For example, at the collocated PM_{10} site in February 2014, both samplers lost multiple samples during the month due to power outages. However, when comparing the coding of these side-by-side samplers, SESD auditors observed the primary sampler coded with AV (i.e., power outage) and the collocated sampler coded AL (i.e., voided by operator) for the first pair of void samples, and then the converse coded for the second pair of void samples. MPHDPCD staff stated that data processing techniques had changed over the past three years, which could help explain this inconsistency – as well as others observed in the data set. Previously, MPHDPCD tried to apply null value codes to data on the same day the data was perceived to be invalid. Presently, staff wait until the end of the month to apply data codes, after information has been analyzed and a cause for the data loss has been verified.

Recommendation: The recent change in data processing should help improve the agency's data coding, in general. However, additional efforts should be made during the data verification/validation process to ensure data coding is consistent between collocated samplers, as

well as across pollutants. SESD recommends MPHDPCD augment its data review process and capture the additional procedures in a Data Handling SOP.

4.5 QUALITY ASSURANCE

4.5.1 Finding: Existing MPHDPCD air monitoring SOPs need to be revised.

Discussion: SOPs are dynamic documents that require routine review and revision. EPA Region 4 grant commitments require SOPs to be reviewed on an annual basis and revised whenever procedures have changed. The grant commitments further require the development of new SOPs within six months of instrument start-up. The EPA QA Handbook (May 2013) recommends the routine review of SOPs – see Section 5.3 of the guidance for more detailed information. The QA Handbook further recommends the development of a SOP master list, which contains the titles and document control numbers of each SOP maintained by the agency. A master list can be used to ensure the most recent versions of documents are being utilized by agency staff; the list can also be used to track the annual review of each document.

The six MPHDPCD air monitoring SOPs reviewed in preparation of this TSA are listed in Section 2 of this report. Four of these SOPs were last revised in 1999; the two remaining SOPs were revised in 2003 and 2007. The procedures described in some of these documents do not accurately reflect the work conducted by agency staff or the equipment currently in place. MPHDPCD staff were aware of this issue during the TSA.

Recommendation: SOPs need to be updated to represent the current procedures and instrumentation employed by MPHDPCD. The SOPs also need to address areas where improvement within the agency's network is needed (identified within the body of this TSA report). SESD requests MPHDPCD develop a specific schedule for SOP development and revisions, detailing the order of priority, and projecting submission dates to EPA. SESD requests a copy of the revision schedule.

SESD further recommends that a master list of MPHDPCD SOPs be compiled by the agency, which is managed by a designated member of the MPHDPCD staff – ideally, a quality assurance officer. Once all MPHDPCD SOPs have been officially revised, the quality assurance officer should be responsible for ensuring that necessary review of the SOPs occurs every year. The annual SOP review should be documented. If procedures or equipment have not changed, the SOP does not need to be revised that year; if changes have occurred, however, the SOP should be revised. Any new equipment procured by MPHDPCD should have an SOP developed within six months of start-up; that new SOP should be added to the master list and tracked accordingly.

4.5.2 Finding: A Data Handling SOP needs to be developed.

Discussion: MPHDPCD has augmented its data review activities since the 2013 TSA. However, these activities have not been formalized into a Data Handling SOP. A Data Handling SOP (which details routine verification, validation, AQS processing, and annual certification procedures) is needed to ensure staff validate data in a complete and consistent manner. A Data Handling SOP would also enhance the agency's quality system, as well as serve as a training aid and legacy documentation in the event of staff turnover. The findings and concerns in Section 4.4 above illustrate data handling errors in the agency's 2013-2015 data set. These errors could be minimized with the advent of a Data Handling SOP.

During the TSA, SESD auditors discussed the need for this SOP with MPHDPCD staff. MPHDPCD staff indicated that work had begun on the document. However, little progress had been made on the SOP to date because the agency was trying to determine the most efficient data review process (data flow), given their current recordkeeping and data management structure. SESD auditors observed a portion of MPHDPCD's data verification/validation process when specific data points were investigated "from the cradle to the grave" during the TSA. The investigation of some data points involved reviewing electronic strip charts, Excel forms, site logbooks (both scanned and hardcopy versions), laboratory logbooks (hardcopy), Dickson charts (hardcopy), and a data validation logbook (hardcopy) in order to obtain all of the necessary information. SESD acknowledges that a simplified data flow path is needed to streamline the agency's data handling process. Consolidation of records into one centralized location could facilitate this process. See Concern 4.2.3 and Observation 4.3.3 above. Additionally, utilizing more digital means of recordkeeping – and/or putting more resources towards routine scanning of all records/logbooks – may prove valuable.

Recommendation: As stated in Finding 4.5.1 above, SESD requests MPHDPCD develop a specific schedule for SOP development and revisions. The Data Handling SOP should be included in that schedule. SESD requests MPHDPCD to consider the development of this specific SOP a high priority.

SESD acknowledges that a simplified data flow path would benefit the agency by reducing the time it takes staff to review and validate data; but, the creation of a more streamlined process may take a considerable amount of time to develop and implement. With that in mind, SESD recommends MPHDPCD staff focus on capturing the current data review process in an official SOP, establishing a formal procedure for current operations. MPHDPCD then can formalize the data coding techniques that will be utilized by the agency and revise the SOP after any changes to the agency's recordkeeping and/or data management practices have been implemented.

4.5.3 Finding: Expired standards were utilized by MPHDPCD staff during required QC activities.

Discussion: During the TSA, annual certification records were available for all of the standards utilized within the MPHDPCD network. SESD auditors reviewed all of the certificates during the TSA. Two occurrences were found in which expired standards were utilized in the network. First, an expired Tetra Cal (flow device) was utilized to conduct flow rate verifications. Upon review

of the data in AQS associated with these flow verifications, SESD auditors found that MPHDPCD staff had already flagged the particulate matter data impacted by this oversight. The second occurrence of utilizing expired standards was in the PM_{10} gravimetric laboratory. PM_{10} mass reference standards that were out of certification were utilized during four weighing sessions, which impacted approximately twelve samples collected from three monitoring sites.

Recommendation: MPHDPCD will need to flag the twelve PM_{10} samples impacted by the use of expired mass reference standards in the gravimetric laboratory. SESD recommends an AQS qualifier flag of "1" (i.e., Critical Criteria) be added to this data.

As stated previously in Observation 4.3.3 above, SESD recommends that MPHDPCD develop a master spreadsheet that contains all of the standards utilized within the agency's network. The spreadsheet could be programmed to utilize conditional formatting, which could alert staff when an expiration is imminent. Additionally, the use of Excel spreadsheets or an Access database in the PM_{10} laboratory could alert staff of pending expirations and/or prevent the use of an expired standard.

4.5.4 **Concern:** More resources are needed for quality assurance activities.

Discussion: Findings 4.5.1 – 4.5.3 of this report illustrate areas where improvement is needed within the MPHDPCD quality assurance program. Additionally, items detailed above in 4.1.1, 4.2.1, and 4.4.1 through 4.4.5 further illustrate the need for additional resources directed towards quality assurance activities.

According to the responses in the TSA questionnaire form (see Appendix A), the MPHDPCD Air Monitoring Program Manager is also the QA Manager, the Laboratory Manager, the Field Operations Team Lead, and the Data Management Lead; she also serves in the field as a back-up field technician approximately once per calendar quarter, processes data for AQS (when needed), and spends a fraction of her time working in the agency's Asbestos program. Ideally, any person charged with QA oversight activities should be independent from routine field operations, or any data-generating activity. Given the multitude of significant tasks the Program Manager is assigned, time and focus directed towards quality assurance may be somewhat limited.

MPHDPCD is currently in the process of transitioning into being its own Primary Quality Assurance Organization (PQAO). Previously, the Tennessee Department of Environment and Conservation (TDEC) had served as the PQAO for MPHDPCD (as well as the other local air quality programs operated within the state). This new responsibility of PQAO brings to the MPHDPCD additional responsibilities, including the need for increased emphasis on quality assurance. For example, MPHDPCD is preparing to conduct the annual performance audits required by 40 CFR Part 58, Appendix A. This activity has been conducted by TDEC historically. MPHDPCD recently purchased new equipment for these audits, which will also require the development of new SOPs (as discussed in Finding 4.5.1 above). Performance audits should be conducted by personnel independent from the routine data operations, in accordance with 40 CFR

Part 58, Appendix A. When discussing how MPHDPCD plans to implement these audits, staff indicated that – given the current staff size and workload – the Air Program Director may be tasked with the responsibility.

MPHDPCD staff are also developing annual certification procedures for the equipment TDEC historically certified. These new procedures will result in the need for an additional SOP, as well as staff charged with implementing and overseeing the certification procedures.

MPHDPCD currently does not conduct internal systems audits. According to MPHDPCD staff, TDEC conducted the systems audits in the past; however, in recent years, TDEC has not conducted the needed reviews. An internal system audit is a proactive assessment to determine whether or not the agency is implementing its QAPP(s) and SOPs as written. A systems audit will also ascertain the quality of data collected by the agency. Presently, these important audits are conducted by EPA staff once every three years, pursuant to 40 CFR Part 58, Appendix A, Section 2.5. However, in order to ensure continued compliance with regulatory requirements, as well as minimize potential data loss, internal systems audits should be conducted on a more routine basis by a designated quality assurance officer within the agency.

Recommendation: MPHDPCD maintains a sizeable ambient air monitoring program with limited staff. MPHDPCD would benefit from an additional staff member conducting quality assurance activities.

SESD acknowledges that an additional staff member was hired in September 2015, which has already resulted in improvements to the agency's data quality (see Section 3). The new staff member's responsibilities primarily involve data handling and AQS administration. The hiring of this individual brings the total number of staff dedicated to air monitoring activities to four employees. However, as stated above, there are additional quality assurance activities needed to bolster MPHDPCD's quality system, including SOP development/oversight, in-house instrument certification, routine Appendix E siting evaluations, and implementation of internal performance and systems audits. The implementation of these necessary enhancements will increase the responsibilities of current staff members. SESD further notes that recent changes to air monitoring regulatory requirements may result in the expansion of the MPHDPCD monitoring program in the future, which will also impose additional responsibilities upon these four employees. With that in mind, the addition of another staff member would strengthen the quality system by providing personnel independent of data collection activities to perform QA, as well as assist in adsorbing the additional responsibilities resultant of this TSA and an expanding network.

5.0 Conclusions

The MPHDPCD has completed many upgrades and enhancements to its ambient monitoring program in the past three years. Areas of improvement are identified throughout the body of this TSA report. The

dedication and commitment of the MPHDPCD air monitoring staff were evident; their achievements in the past three years are commendable.

Corrective actions implemented as a result of the 2013 TSA have successfully addressed many of the areas in the MPHDPCD network which needed renovation. During this 2016 TSA, the findings illustrate the need for the agency to fine-tune and standardize some of its newly established procedures, especially regarding data handling activities. The findings also demonstrate the need for MPHDPCD to streamline its records management practices, as well as further expand its quality assurance program.

MPHDPCD operates a sizeable air monitoring network, which includes seven monitoring stations and a PM_{10} gravimetric laboratory. The operation of this network, thus, generates a large amount of data and records that must be managed. Currently, MPHDPCD employs a combination of electronic and hardcopy recordkeeping practices. During this TSA, SESD auditors observed that all requested records were available, but were not always easy to locate; in some instances, multiple logbooks or binders had to be reviewed in order to find a specific piece of information.

SESD auditors observed multiple hardcopy logbooks in use across the criteria pollutant network, but most notably for particulate matter sample collection activities. For example, SESD auditors observed hardcopy $PM_{2.5}$ records in the agency's shop (e.g., a filter shipping/receiving logbook and a separate hardcopy worksheet for documenting shipping temperatures), hardcopy logbooks stored at the field sites, as well as a traveling logbook maintained by the field technician. All of these hardcopy records contain information needed during the data verification/validation process. Moreover, these hardcopy files work in conjunction with other electronic records that must be maintained and reviewed during data validation activities. Although maintaining hardcopy and electronic records is acceptable, retrieving information from multiple locations – in multiple formats – can significantly slow the data validation process. Therefore, SESD recommends MPHDPCD consolidate more of its ambient air monitoring records into a centralized repository. Towards that end, SESD suggests that MPHDPCD consider digitizing more of its recordkeeping practices. Upgrading records in this manner should simplify data handling activities and save time. Additionally, utilizing more electronic data management tools – such as spreadsheets and databases – can augment the agency's quality system by automating more data verification processes, which will also save staff time and potentially minimize data validation errors.

Along those lines, some QA/QC data processing errors were identified by SESD auditors which were not identified by MPHDPCD staff during the in-house data verification/validation process. SESD auditors closely reviewed several of these errors and determined them to be the result of typographical mistakes. In other instances, missing values were not observed in the datasets uploaded to the AQS database. A few instances where the agency's ambient data were not consistently compared to the results of QA/QC checks were noted by SESD auditors. However, several instances were identified where concentration data was properly validated, but associated invalid QC checks were erroneously uploaded to AQS. These data handling errors (identified in Section 4 of this report) require corrections in AQS. SESD requests to be notified when all corrections have been made. Please note that any modification to data in AQS after it has been originally certified pursuant to 40 CFR 58.15 requires a recertification of the data. Ultimately, these data processing errors are indicative of limited resources available for quality assurance activities.

MPHDPCD should augment its data verification and validation procedures, add an additional layer of review for data that is manually prepared, and standardize these procedures in a Data Handling SOP.

Existing MPHDPCD SOPs are overdue for revision. The SOPs in place do not accurately reflect the work performed by staff, and in some cases do not represent the instrumentation deployed in the field. Therefore, SESD is requesting MPHDPCD develop an SOP revision schedule for its quality documents, and begin submitting those documents to EPA for approval. EPA Region 4 further recommends that SOPs be reviewed internally on an annual basis, to proactively assess whether the SOPs correctly implement the agency's QAPP and EPA regulatory requirements. The annual review of SOPs should be tracked and documented.

Finally, MPHDPCD would benefit from an additional staff member dedicated to quality assurance activities. SESD acknowledges that an additional staff member was hired in September 2015 for this purpose. However, MPHDPCD has recently become its own PQAO, which brings with it additional QA responsibilities. Areas where increased resources are needed in the QA program include QAPP/SOP oversight and maintenance, instrument certification, Appendix E siting evaluations, implementation of internal performance and systems audits, in addition to the data handling activities mentioned above. The successful implementation of these necessary enhancements will increase the responsibilities of current staff members. As the MPHDPCD monitoring network expands in the future, an additional staff member dedicated to these activities will prove critical.

MPHDPCD must develop a corrective action plan and timeline to address the findings and concerns identified in Section 4 of this report and respond back to SESD within 30 days of receipt. Please note that the corrective actions do not have to be completed by this date, only a plan to address the findings. If MPHDPCD anticipates that the development of the corrective action plan will not be completed within 30 days after the receipt of this report, please contact SESD to request an extension.

APPENDIX A

United States
Environmental Protection Agency
Region 4

Science & Ecosystem Support Division
980 College Station Road
Athens, Georgia 30605

Ambient Air Monitoring
Technical System Audit Form

Table of Contents

1) GENERAL INFORMATION

a) Program Organization

Organization Name:
- Metro Public Health Department, Air Monitoring Program

Address:
- 2500 Charlotte Avenue

City, State, and Zip Code:
- Nashville, Tennessee 37209

Phone:
- 615-340-0424

Agency Director:
- John Finke

Ambient Air Monitoring (AAM) Network Manager:
- Erin Jackson

Quality Assurance Manager:
- Erin Jackson

QA Auditors:
- n/a

Field Operations Supervisor / Lead:
- Erin Jackson

Laboratory Supervisor:
- Erin Jackson

QA Laboratory Manager:
- Erin Jackson

Data Management Supervisor / Lead:
- Erin Jackson

AQS Submitter:
- Tiffany Lanh

Insert an Organizational Chart (or provide a hard copy during the audit):

b) Personnel

List available personnel and select their primary duties:								
Name	Network Design and Siting	QC Activities	QA Activities	Equipment Repair & Maintenance	Data & Data Management	Financial Management	Site Operation (PM, Gaseous, Met)	Other Non-Ambient Air Monitoring Duties
Erin Jackson	x	x	x		x		x	x
Scott Lough		x	x	x			x	
Greg Lowery		x	x	x			x	
Tiffany Lanh					x			
Joh Finke						x		

In your agency, are site operators responsible for running all of the instruments at their assigned sites, certain instruments (ex. O_3) at multiple sites, or a combination of the two?

Scott Lough runs the gaseous monitors and Greg Lowery runs the particulate monitors. Scott Lough is Greg Lowery' s backup and Erin Jackson is Scott Lough's backup.

List personnel who have authority or are responsible for:		
Activity	Name	Title
QA Training Field/Lab	Erin Jackson	Air Monitoring Manager
Grant Management	John Finke	Air Pollution Director
Purchases Greater than $500	John Finke	Air Pollution Director
Equipment and Service Contract Management	Erin Jackson	Air Monitoring Manager
Staff Appointment	Erin Jackson	Air Monitoring Manager
Monitoring Operations	Erin Jackson	Air Monitoring Manager

Questions	Yes	No	Comments
Does your agency utilize any contractors in your air monitoring program? If no, skip to the next table.	x		IML is the contract laboratory for PM2.5
Who is responsible for oversight of contract personnel?	Erin Jackson		
What steps are taken to ensure contract personnel meet training and experience criteria?			
Does the contractor follow an EPA approved QAPP?			IML has a QAPP. I am not sure if it is EPA approved.
- Where/how is this documented?	On the shared drive.		
How often are contracts reviewed and/or renewed?	The IML contract (only contract we have) is a 5 year contract that is required to be put through the competitive bid process.		

Comment on the need for additional personnel, if applicable:

- The Air Monitoring Program is fully staffed at this time.

List your district/regional offices and associated staff below (State Agencies Only)		
Name	Address	Staff

c) Training

Question	Yes	No	Comments
Does the agency have a training program and training plan?	x		The QMP and QAPP discuss training. Instrument specific vendor training is participated in as funds are available.
Where is it documented?	QMP and QAPP		
Does it make use of seminars, courses, and/or EPA sponsored courses?	x		
Are personnel cross-trained for other ambient air monitoring duties?	x		
Are training funds specifically designated in the annual budget?	x		Training funds are designated in the annual budget but are not specific to air monitoring personnel.
Does the Training Plan Include: 1. Training requirements by position		x	
2. Frequency of Training		x	
3. Training for contract personnel		x	
4. A list of core QA related courses		x	

Indicate below the three most recent training events and identify the personnel participating in them:		
Event	Date(s)	Participant(s)
1. Thermo Scientific Particulate Instrument Training	3/19/15-3/20/15	Greg Lowery
2. Thermo Scientific Gaseous Instrument Training	2/2/15-2/4/15	Scott Lough
3. Teledyne Level II Training	1/12/15-1/16/15	Scott Lough

d) Facilities

Identify the principle facilities where the agency conducts work related to air monitoring. Do not include monitoring stations, but include facilities where work is performed by contractors or other organizations. Select which purpose(s) each facility serves. Add additional lines as necessary

Facility Address	General Office Space	Data Verification and Processing	Criteria Gas Instrument Maintenance and Storage	Standards Certification / Calibration	PM Filter Weighing	Records Storage	Air Toxics Maintenance and Storage	Air Toxics Laboratory
Metro Public Health Department 2500 Charlotte Avenue, Nashville, TN	x	x	x		x	x		
Inter-Mountain Laboratory 555 Absaraka Street Sheridan, WY		x			x			
TDEC APC Quality Assurance 400 Hart Lane, Nashville, TN				x				
SESD 980 College Station Road Athens, Georgia				x				
Mesa Labs 10 Park Place Butler, NJ				x				
Rite Weight 3802 Irvindale Road Duluth, GA				x				

Are monitoring sites ever used for storage of equipment, spare parts or supplies?

- No

Identify any facilities that should be upgraded. Identify by function and any suggested improvements or recommendations.

- No upgrades facility upgrades at this time.

Are facilities adequate concerning safety? If not, please explain and give suggested improvements or recommendations.

- The Air Monitoring shelters and facilities are regularly being discussed with regards to safety. Improvements have been made at our sites with regards to ladder safety and decreased pollutant exposure during QC checks. One area we are exploring currently is technician safety with regards to rooftops and possible fall protection.

Are there any significant changes likely to be implemented to agency facilities within the next three years?		
Facility	Function	Proposed Change - Date
Hillwood High School	PM2.5 monitor	unspecified

Comment on the agency's need for additional physical space (laboratory, office, storage, etc.)

- No additional physical space needed.

2) QUALITY MANAGEMENT

a) Quality Assurance and Quality Control

i) Status of Quality Assurance Program

QA activities are performed and supported by sources uniquely different from those used in routine QC activities. Independent / dedicated equipment, different personnel and calibration methodologies are purposely used in performing QA audits, performance checks, etc.

Question	Yes	No	Comments
Does the agency perform QA activities with internal personnel? If no, skip this table.	x		
Does the agency maintain a separate laboratory to support quality assurance activities?		x	
Has the agency documented and implemented specific audit procedures separate from monitoring procedures?	x	x	The Air Monitoring Program is in the process of developing audit procedures for PQAO purposes. Currently audits are performed by TDEC.
Are there two levels of management separation between QA and QC operations? Please explain:		x	
Does the agency have separate auditing equipment and standards (specifically intended for sole use) for audits?	x	x	The Air Monitoring Program has purchased and received separate auditing equipment and standards specifically for satisfying PQAO requirements. They are not in use at this time.

Do you conduct biweekly precision point checks?
Yes

Are they automated or conducted manually?
Manually

Select which of the following <u>additional</u> QC you conduct at your gaseous sites				
Precision Checks	Typically Performed?	How?		Frequency
		Manually	Automated	
Precision Point				
Zero Precision Span	x	x		**biweekly**
Zero Precision				
Probe Line Integrity Checks				
Other: _____				

ii) <u>Audits</u>

Question	Yes	No	Comments
Does the agency have separate facilities to support audits and calibrations?	x		At this moment TDEC audits our sites.
If the agency has in place contracts or agreements with another agency/contractor to perform audits/calibrations, please name the organization and briefly describe the type of agreement.	TDEC and EPA both audit our air monitors.		
Does the agency maintain independence of audit standards and personnel?	x		Audit standards are certified by independent entities.
Do any site operators audit their own sites?		x	
Does the agency have a certified source of zero air for performance audits?			Zero air is generated by a zero air generated that utilizes scrubbers.
How do you generate your zero air?	Zero air generator		
Does the agency have procedures for auditing and/or validation performance of meteorological monitoring?		x	
Has the agency established and documented criteria to define agency-acceptable audit results?		x	

Question	Yes	No	Comments
Are your sites regularly reviewed for Appendix E siting criteria?	x		Frequency: annually beginning in 2015
Do you conduct internal audits of your air monitoring agency?		x	
(1) How frequently?			
(2) What type of audit is conducted (e.g., performance or systems audit)?			
(3) Who receives the results of these audits?			
(4) Do you report these results to EPA?			

Please provide a list of internal audit standards currently being used (these do not include standards used for calibrations and/or biweekly checks). Add additional lines as necessary.

Name	Model Number	Date of Last Certification	Approximate Age (years)

****Please have certifications of standards available for viewing during the audit**

Question	Yes	No	Comments
Does your agency participate in NPAP, $PM_{2.5}$ PEP, Pb PEP and other performance audits performed by an external party and/or using external standards?	x		
If the agency does not participate, please explain why:			
Are NPAP audits performed by QA staff, site operators, calibration staff, and/or another group?			EPA region 4
Is your agency audited by the State (if you are a local agency)?	x		
(1) How frequently?	quarterly		
(2) What type of audit is conducted (e.g., performance or systems audit)?	Performance audits		
(3) Who receives the results of these audits?	Air Monitoring Manager– Erin Jackson		
(4) Do you report these results to EPA?	x		

Who is primarily responsible for coordinating participation in:

(1) The National Performance Audit Program (NPAP)?
Air Monitoring Manager

(2) $PM_{2.5}$ Performance Evaluation Program (PEP)?
Air Monitoring Manager

(3) Lead Performance Evaluation Program (PEP)?
N/A

Please complete the table below:	
Parameter Audited	Date of Last NPAP and/or PEP Audit
CO	
O_3	
SO_2	
NO_2	
$PM_{2.5}$	
Pb	

b) Planning Documents

QMP Questions	Yes	No	Comments
Has the QMP been approved by EPA within the last five years?	x		Date of Original Approval: Date of Last Revision: 5/22/13 Date of Last Approval: 7/22/13
QAPP Questions	**Yes**	**No**	**Comments**
Has the QAPP been reviewed by EPA ?	x		Date of Original Approval: Date of Last Revision: 12/21/06 Date of Last Approval: 3/7/07
Does the State review your QAPP prior to EPA review? (local agencies only)		x	
Does your agency have any revisions to your QAPP pending?	x		Revised QAPP was submitted to EPA 12/8/15.
How does the agency verify the QAPP is fully implemented?			
How is the QAPP available to the staff (e.g.., electronically, hard copies at site, etc.)	A copy of the 2006 QAPP and the submitted 2015 QAPP are located on the shared drive.		
SOP Questions	**Yes**	**No**	**Comments**
How does the agency verify that the SOPs are implemented as provided (e.g., staff are regularly observed for correct implementation of SOPs)?	Excel spreadsheets are built with the acceptance criteria outlined in the SOP's. These spreadsheets are used in the filed for Precision/Zero/Span checks and calibrations.		
How are revisions to the SOP distributed?			
How are SOPs available to the staff (e.g.., electronically, hard copies at site, etc.)	SOP's are available electronically and in paper form.		
Are any new monitoring SOPs needed? If yes, please list in comments section.	x		All the SOP's need some sort of revision.

List all of the agencies current SOPs:		
Title	Date of Last EPA Approval	Pollutant of Concern (if applicable)

c) General Document Policies

Question	Yes	No	Comments
Does the agency have a documented records management plan?			
Does the agency have a list of files considered official records and their media type? (i.e., paper, electronic)			
Does the agency have a schedule for retention and disposition of records?			
Are records maintained for at least three years?	x		
Who is responsible for the storage and retrieval of records?	Air Monitoring Technicians and the Air Monitoring Manager		
What security measures are utilized to protect records?			
Where/when does the agency rely on electronic files as primary record?	AirVision polls the hourly ambient air monitoring data and PM2.5 filter based information is sent electronically from IML.		
What is the system for storage, retrieval and backup of these files?	All electronic files are backed up to a central server nightly.		

d) Corrective Action(s)

Question	Yes	No	Comments
Does the agency have a comprehensive corrective action program in place?			Agency has a Corrective Maintenance Form that is filled out when necessary.
Have the procedures been documented?	x		
1. As a part of the QA project plan?	x		
2. As a separate standard operating procedure?		x	
Does the agency have established and documented corrective action limits for QA and QC activities?	x		
Are procedures implemented for corrective actions based on results of the following which fall outside of established limits:			
1. Performance Evaluations	x		
2. Precision Goals	x		
3. Bias Goals			
4. NPAP Audits	x		
5. PEP Audits			
6. Validation of one point QC Check Goals	x		
7. Completeness Goals	x		
8. Data Audits			
9. Calibrations and Zero Span Checks	x		
10. Technical Systems Audit	x		
Have the procedures been documented?			

How is responsibility for implementing corrective actions assigned? Briefly discuss
Corrective Actions are generally assigned to the technician responsible for the instrument/site that needs the correction.

How does the agency follow up on implemented corrective actions? Corrective actions are assigned a corrective action form that is filled out by the operator and reviewed by the QA technician initially and ultimately by the Air Monitoring Manager.

Please fill out the table below for <u>precision</u>			
Pollutant	Action Level	Corrective Action (if exceeded)	Redbook Guidance Action Level Reference
O_3			QA Handbook Volume II, Appendix D Revision No. 1 Page 3 of 30
CO			QA Handbook Volume II, Appendix D Revision No. 1 Page 5 of 30
NO_2			QA Handbook Volume II, Appendix D Revision No. 1 Page 7 of 30
SO_2			QA Handbook Volume II, Appendix D Revision No. 1 Page 9 of 30

Please fill out the table below for <u>accuracy</u>			
Pollutant	Action Level	Corrective Action (if exceeded)	Redbook Guidance Action Level
O_3			QA Handbook Volume II, Appendix D Revision No. 1 Page 3 of 30
CO			QA Handbook Volume II, Appendix D Revision No. 1 Page 5 of 30
NO_2			QA Handbook Volume II, Appendix D Revision No. 1 Page 7 of 30
SO_2			QA Handbook Volume II, Appendix D Revision No. 1 Page 9 of 30

At what point do you invalidate data?

e) Quality Improvement

Question	Yes	No	Comments
Have all deficiencies indicated on the previous TSA been corrected? If not, explain.		x	All programmatic changes have been implemented. Still working on SOP's.
What actions were taken to improve the quality system since the last TSA?			
Since the last TSA, do your control charts indicate that the overall data quality for each pollutant steady or improving?			
For areas where data quality appears to be declining, has a cause been determined?			
Are there pending plans for quality improvement such as purchase of new or improved equipment, standards, or instruments?		x	

3) NETWORK MANAGEMENT/FIELD OPERATIONS

a) Network Design

Complete the table below for each of the sites in your air monitoring network (active in the last three years) with the number of instruments measuring each pollutant (including NCore low level instruments – e.g. 1 low level CO + 1 regular CO = 2 CO instruments).

AQS ID	Common Site Name	Pb	CO	SO_2	NO_2	O_3	Manual				Collocated		Continuous		Meteorology
							$PM_{2.5}$	PM_{10}	$PM_{2.5}$ speciation	$PM_{2.5}$ Carbon	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	
470370036	Hillwood						x								
470370026	Percy Priest Dam					x									
470370011	East Health Center			x	x	x									
470370023	Lockeland						x				x		x		
470370002	Trevecca							x							
470370024	McCann							x				x			
470370040	Near Road		x		x										

Complete the table below with the number of spare monitor(s) you have on hand for measuring each pollutant (including NCore low level instruments).													
Pb	CO	SO_2	NO_2	O_3	Manual				Collocated		Continuous		Meteor-ology
					$PM_{2.5}$	PM_{10}	$PM_{2.5}$ speciation	$PM_{2.5}$ Carbon	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	
	2	1	2	1	1	1					1		

Select which of the following are typically found at your Gaseous and PM sites		
Equipment/ Supplies	Gaseous	PM
Data Logger	x	
Calibrator	x	
Gas Blender	x	
Zero Air System	x	
Perm Tube Oven		
Paper Strip Chart		
Permanent Site Computer		
Phone		
Modem	x	
DSL Connection		
Cellular Modem Connection	x	
Meteorological Station		
Interior Temperature Probe	x	x
Interior Min/Max Thermometer		
Air Conditioner / Heater	x	
Uninterrupted Power Supply or Backup Power		
Instrument Manuals	x	
Instrument Logbooks	x	x
Site Logbook		
SOP's		
Other:_____		
Other:_____		

Select which of the following are typical of your Probe System	
Tee'd Probe System	x
Retractable Probe System	
Glass Manifold within Probe System	
Heat Tape for Moisture Control	

If none of the above is applicable, please describe your probe system.

-

How often do you clean / replace your probe lines?

- annually

What material are your probe lines made of?

- teflon

What material are your inlet funnels made of (e.g. glass, Teflon, plastic)?

- Stainless steel. They are above the inlet and function as rain guards.

How often do you change the particulate filter on the back of the instrument?

- Particulate filters are at the inlet and are changed monthly.

How often do you clean your glass manifold (if applicable)?

N/A

How do you connect your instrument to your data logger (analog, RS232, or Ethernet)? ethernet

Question	Yes	No	Comments
What is the date of the most current Monitoring Network Plan?	6/30/15		
Is it available for public inspection?	x		All Air Pollution Records are public.

Has EPA granted waivers for any of your monitoring sites?

No

Are you aware of any sites that are not currently meeting the requirements of 40 CFR Part 58 Appendix D & E?

Question	Yes	No	Comment
Are hard copy site information files retained by the agency for all air monitoring stations within the network?	x		
Does each station have the required information including:			
1. AQS Site ID Number?	x		
2. Photographs/slides to the four cardinal compass points?			
3. Startup and shutdown dates?			
4. Documentation of instrumentation?			
Who has custody of the current network documents?	Name: Erin Jackson Title: Air Monitoring Manager		
Does the current level of monitoring effort, station placement, instrumentation, etc., meet requirements imposed by current grant conditions?	x		
How often is the network siting reviewed?	annually		
Do any sites vary from the required frequency in 40 CFR 58.12?			
Does the number of collocated monitoring stations meet the requirements of 40 CFR 58 Appendix A?			
Is each method for PM monitoring collocated with the same method type? (40 CFR 58 Appendix A Section 3.2.5.2 paragraph (a))			

b) Changes to the Network since the Last Audit

Please provide information on any site changes since the last audit:				
Pollutant	Site ID	Site Address	Site Added/Deleted/ Relocated	Reason (Assessment, lost lease, etc.) Provide documentation of reason for each site change
CSN	470370023		CSN deleted	

c) Proposed Changes to Network

Please provide information on proposed site changes, including documentation of the need for change and any required approvals:				
Pollutant	Site ID	Site Address	Site to be Added/Deleted/ Relocated	Reason (Assessment, lost lease, etc.) Provide documentation of reason for each site change

d) Field Support

Question	Yes	No	Comments
On average, how often are most of your stations visited by a field operator?	1/ 2 weeks (gaseous), every work day for particulate		
Is this visit frequency consistent for all reporting organizations within your agency?			

i) Instrument Inventory

Please list instruments in your inventory:			
Pollutant	Manufacturer	Models	Reference or Equivalent Method Number
SO_2	Thermo	43i	
NO_2	Thermo, Teledyne	42i	
CO	Thermo, Teledyne	48i,	
O_3	Thermo	49i	
PM_{10}	R&P		
$PM_{2.5}$	Thermo	2025i	
Pb			
Multi gas calibrator	Thermo	146i	
$PM_{2.5}$ speciation			
$PM_{10\text{-}2.5}$ speciation			
$PM_{10\text{-}2.5}$ FRM mass			
Continuous $PM_{2.5}$ mass	Thermo	1405	
Trace levels (CO)	Thermo	48iTL	
Trace levels (SO_2)			
Trace levels (NO)			
Trace levels (NO_y)			
Surface Meteorology			
Data Logger	Agilaire	8832 and 8872	
Others			

ii) Calibration

Please indicate the frequency of multi point calibrations:		
Pollutant	Frequency	Name of Calibration Method
Ozone	quarterly	
NO2	quarterly	
SO2	quarterly	
CO	quarterly	
PM2.5	quarterly	
PM10	quarterly	

Please list the authoritative standards used for each type of flow measurement, indicate the certification frequency of standards to maintain field material/device credibility:		
Flow Device	Primary Standard	Frequency of Certification
HiVol Orifice	Mesa Labs	annual
Streamline		
Trical	BGI	annual
Bios	High Flow and Low Flow	annual
DeltaCal	BGO	annual
Gilibrators	Teledyne, Thermo, Environics	annual
Other		

Please list the authoritative standards and frequency of each type of dilution, permeation and ozone calibrator and indicate the certification frequency:		
Calibrator	Primary Standard	Frequency of Certification
Permeation Calibrator Flow Controller		
Permeation Calibrator Temperature		
Dilution Calibrator air and gas Flow Controllers		
Field/Working Standard Photometer		
Ozone Generator	Thermo	annual

Please identify station standards for gaseous pollutants at representative air monitoring stations			
Parameter	Station(s)	Identification of Standard(s)	Recertification Date(s)
CO	Near Road	Gas cylinders	
NO_2	East and Near Road	Gas cylinders	
SO_2	East	Gas cylinders	
O_3	Percy Priest Dam and East	Teledyne 703E	

If an instrument goes down, at what length of time would you <u>recalibrate</u> the instrument before bringing it back online (24 hours, 48 hours, etc.)?

Question	Yes	No	Comments
Are field calibration procedures included in the document SOPs?	x		Location (site, lab, etc.):
Are calibrations performed in keeping with the guidance in section Vol II of the QA Handbook for Air Pollution Measurements Systems?	x		If no, why not?
Are calibration procedures consistent with the operational requirements of Appendices to 40 CFR 50 or to analyzer operation/instruction manuals?			If no, why not?
Have changes been made to calibration methods based on manufacturer's suggestions for a particular instrument?			
Do standard materials used for calibrations meet the requirements of appendices to 40 CFR 50 (EPA reference methods) and Appendix A to 40 CFR 58 (traceability of materials to NIST-SRMs or CRMs)?			
Where do field operations personnel obtain gaseous standards?	Air Liquide		
Are those standards certified by: 1. The agency laboratory?		x	

2. EPA/NERL standards laboratory?			
3. A lab separate from this agency's but part of the same reporting organization?			
4. The vendor?	x		
5. Other (describe)			
How are the gas standards verified after receipt?			
Are you involved in the EPA protocol gas certification program?		x	
What equipment is used to perform calibrations (e.g., dilution devices) and how is the performance of this equipment verified?	Dilution system and ozone generators.		
Does the documentation include expiration date of certification?			Ozone generators are certified by SESD and MFC's are certified by TDEC QA group.
1. Reference to primary standard used?			
2. What traceability is used?			
Is calibration equipment maintained at each station?	x		
How is functional integrity of this equipment documented?			
Who has responsibility for maintaining field calibration standards?	Air Monitoring Techs		

iii) Repair

a) Who is responsible for performing preventative maintenance?
Air Monitoring Technicians

b) Is special training provided to them for performing preventative maintenance? Briefly comment on background or courses.
Both technicians have been to training provided by the instrument/monitor vendors. On the job training has also been provided.

c) Is this training routinely reinforced? If no, why not?
As needed and funds are available.

d) What is your preventative maintenance schedule for each type of field instrumentation?
Each instrument has a preventative maintenance schedule. The operating manuals recommend certain maintenance. We implement the recommendations in the manual if they make sense and are applicable.

e) If preventative maintenance is <u>MINOR</u>, it is performed at (check one or more):

___ Field Station
_x_ Headquarters Facilities
___ Equipment is sent to Manufacturer

f) If preventative maintenance is <u>MAJOR</u>, it is performed at (check one or more):

___ Field Station
___ Headquarters Facilities
_x__ Equipment is sent to Manufacturer

g) Does the agency have service contracts or agreements in place with instrument manufacturers? Indicate below which instrumentation is covered. No

h) Comment briefly on the adequacy of availability of the supply of spare parts, tools and manuals available to the field operator to perform any necessary maintenance activities. Do you feel that this is adequate to prevent any significant data loss?

We keep most of the manufacturer recommended spare parts and have an ample supply of tools in the Air Monitoring Lab.

i) Is the agency currently experiencing any recurring problem with equipment or manufacturer(s)? If so, please identify the equipment manufacturer, and comment on steps taken to remedy the problem.

None at this time.

j) Have you ever lost any data due to repairs in the last 2 years?

More than 24 hours? yes
More than 48 hours? yes
More than a week? yes

k) Explain any situations where instrument down time was due to lack of preventative maintenance or unavailability of parts.

iv) Logbooks and Records

Question	Yes	No	Comments
What type of station logbooks are maintained at each monitoring station? (Maintenance logs, calibration logs, personal logs, etc.)	One logbook is assigned to each monitor/instrument.		
What information is included in the station logbooks?	Everything about that monitor, for example maintenance activities, calibrations, precision/zero/span checks are kept in the instrument logbook.		
Who reviews and verifies the logbooks for adequacy of station performance?	QA Technician and Air Monitoring Manager		
How often are logbooks reviewed?	Quarterly		
How is control of logbook maintained?	They are scanned quarterly		
Where is the completed logbook archived?	On the shelf in the Air Monitoring Lab.		
What other records are retained?			
1. Zero span record?	x		
2. Gas usage log?	x		
3. Maintenance log?	x		
4. Log of precision checks?	x		
5. Control charts	x		
6. A record of audits?	x		
Please describe the use and storage of these documents.	They are used during the monthly data validation process and stored on the shared drive of the computer.		
Are calibration records, or at least calibration constants, available to field operators?	x		
Are logbooks backed up regularly to ensure against theft/vandalism?	x		

3) DATA MANAGEMENT

a) Data Handling

Question	Yes	No	Comments
Is there a procedure, description, or a chart which shows a complete data sequence from point of acquisition to point of submission of data to EPA?			We are working towards a data handling SOP.
Please describe or provide a data flow diagram from collection to submittal of data. Please include detail regarding data review and validation.	Data is collected via AirVision for continuous monitors and reviewed daily. Monthly, data is validated by reviewing trend charts and QC spreadsheets for continuous. For PM2.5 filter based monitor data is validated by reviewing site files, QC paper work, transport information and IML reports. Finally filter based PM10 data is validated by reviewing field data QC checks and weigh lab information.		
Are procedures for data handling (e.g. data reduction, review, etc.) documented?			We are working towards a data handling SOP.

In what media (e.g., diskette, data cartridge, or telemetry) and formats do data arrive at the data processing location? Please list below:

Category of Data (by Pollutant)	Data Media and Formats
Continuous monitors	telemetry
PM10	Paper transport
PM2.5	Thumb drive and paper transport

How often are data received at the processing location from the field sites and laboratory?	daily		
Is there documentation accompanying the data regarding any media changes, transcription, or flags which have been placed into the data before data are released to agency internal data processing?		x	
- Describe the type of documentation			
How is data actually entered into the computer system (e.g. computerized transcription (copy from disk or data transfer device), manual entry, digitization of strip charts, or other)?	Manual entry for PM10 and computerized transcription for PM2.5 and continuous.		
For manual data, is a double-key entry system used (e.g., a second pair of eyes double checking for transcription errors)?	x		

b) Software Documentation

Question	Yes	No	Comments
Does your agency submit data directly to AQS?	x		
Does your agency participate in AirNow?	x		
How does your agency process P/A data?			
Does the agency have information on the reporting of precision and accuracy data available?			
What software is used to prepare air monitoring data for release into the AQS and AirNow database? Please list the documentation for the software currently in use for data processing, including the names of the software packages, vendor or author, revision numbers, and the revision dates of the software.	Airvision, Agilaire, Build201407.15.2. Should be using Build 270 soon.		
What is the recovery capability in the event of a significant computer problem (i.e. how much time and data would be lost)?	All data is backed up nightly.		
Has your agency tested the data processing software to ensure its performance of the intended function is consistent with the QA Handbook, Volume II, and Section 14.0?			
Does your agency document software tests?		x	If yes, provide the documentation

c) Data Validation and Correction

Question	Yes	No	Comments
Has your agency established and documented the validation criteria?			We are working towards a data validation SOP.
Does documentation exist on the identification and applicability of flags (i.e., identification of suspect values) within the data as recorded with the data in the computer files?			
Does your agency document the data validation criteria including limits for values such as flow rates, calibration results, or range tests for ambient measurements?	x		
1. If yes, please describe what action the data validator will take if he/she find data with limits exceeded (e.g., flags, modifies, deletes, etc.)	Flag or invalidate depending on situation/circumstances and additional supporting documentation.		
2. If yes, give examples to illustrate actions taken when limits are exceeded.	TEOM flow checks outside of 4% for main flow is invalidated back to the last good flow check.		
How does the agency track missing data?	QA flagging/coding log book.		
Please describe how changes made to data that were submitted to AQS and AirNow are documented.	In the QA flagging/coding log book		
Who has signature authority for approving corrections?	Name: Erin Jackson Program Function: Air Monitoring Manager		
What criteria are used to determine a data point should be deleted? Discuss briefly	If QC check is outside of the acceptable criteria ranges in the red book.		
What criteria are used to determine if data need to be reprocessed? Discuss briefly	If there appears to be an issue with a standard or if the audit instruments are inconsistent.		
Are corrected data resubmitted to the issuing group for cross-checking prior to release?			

d) Data Processing

Question	Yes	No	Comments
Does the agency generate data summary reports?	x		
Please list at least three reports routinely generated, including the information requested below.			
Report Title	Distribution		Period Covered
Monthly Report	Manager and Director		Previous month

Question	Yes	No	Comment
How often are data submitted to AQS and AirNow?	quarterly		
Briefly comment on difficulties the agency may have encountered in coding and submitting data following the guidance of AQS guidelines			
Does the agency routinely request a hard copy printout on submitted data from AQS?			
Are records kept for at least 3 years by the agency in an orderly, accessible form?	x		
If yes, does this include: 1. Raw Data?	x		
2. Calculation?	x		
3. QC Data?	x		
4. Reports?	x		
If no, please comment			
Are PM_{10} concentrations corrected to EPA standard temperature and pressure conditions (i.e. 298°K, 760 mm Hg) before input to AQS?	x		
Are $PM_{2.5}$ and Lead concentrations reported to AQS under actual (volumetric) conditions?	x		
Are audits on data reduction procedure performed on a routine basis?		x	Frequency -
Are data precision and accuracy checked each time they are calculated, recorded, or transcribed to ensure incorrect values are not submitted to EPA?		x	

e) Internal Reporting

What internal reports are prepared and submitted as a result of the audits required under 40 CFR 58, Appendix A?	
Report Title	Frequency

What internal reports are prepared and submitted as a result of precision checks also required under 40 CFR 58, Appendix A?	
Report Title	Frequency

Question	Yes	No	Comments
Do either the audit or precision check reports indicated include a discussion of corrective actions initiated based on audit or precision check results?			

Who has the responsibility for the calculation and preparation of data summaries? To whom are such summaries delivered?			
Name	Title	Type of Report	Recipient

f) External Reporting

For the past 3 calendar years, please list all quarters that data were submitted beyond the 90 day requirement:

Identify the individual within the agency with the responsibility for reviewing and submitting the data to AQS.
Erin Jackson before October 2015 and Tiffany Lanh after October 2015.

Question	Yes	No	Comments
Does your agency report the Air Quality Index?		x	
Has your agency submitted its annual data summary report (as required in 40 CFR 58.15)?	x		
If yes, did your agency's annual report include the following:			
1. Annual precision and accuracy information described in Section 4 of Appendix A?	x		
2. Location, date, pollution source and duration of all episodes reaching the significant harm levels?			n/a
Is Data Certification signed by a senior officer of your agency?			

4) LABORATORY OPERATIONS

a) Routine Operations

What analytical methods are employed in support of your air monitoring network? Add other pollutants not listed to the table.		
Pollutant	Analysis	Name or Description of Method
PM_{10}	gravimetric	
$PM_{2.5}$		
Pb		
$PM_{10-2.5}$		

Please describe areas where there have been difficulties meeting the regulatory requirements for any of the above analytical methods.

Please identify the current versions of written methods, supplements, and guidelines that are used in your agency. Add other pollutants not listed to the table.	
Analysis	Documentation of Method
PM_{10}	Method 2.12, QA Handbook Volume II
$PM_{2.5}$	IML's QAPP, IML's QA Document and the Contract with IML
Pb	
$PM_{10-2.5}$	

Question	Yes	No	Comments
Were procedures for the methods listed above included in the agency's QA Project Plan or SOPs and reviewed by EPA?	x		
Are the SOPs easily/readily accessible for use and reference?	x		
Does your lab have sufficient instrumentation to conduct analyses?	x		

Please describe needs for laboratory instrumentation

No needs at this time.

b) Laboratory Quality Control

Please identify laboratory standards used in support of the air monitoring program, including standards which may be kept in an analytical laboratory and standards which may be kept in a field support area or quality assurance laboratory that is dedicated to the air monitoring program (attach additional sheets if appropriate):

Parameter	Type	ID / Serial Number	Last Recertification Date
Weights	Troemner	A266 and 83966	9/22/15
Temperature	Extech	2329411	5/13/15
Relative Humidity	Extech	2329411	5/13/15
Barometric Pressure			
Balance	Sartorius	11403670	12/15/15
Other			

****Please have certifications of standards available for viewing during the audit**

Question	Yes	No	Comments
Are all chemicals and solutions clearly marked with an indication of shelf life?			N/A
Are chemicals removed and properly disposed of when shelf life expires?			N/A
Are only ACS grade chemicals used by the laboratory?			N/A

Comment on the traceability of chemicals used in the preparation of calibration standards.

Question	Yes	No	Comment
Does the laboratory purchase standard solutions such as those for use with lead or other metals analysis?		x	
Are all calibration procedures documented?			Title: Revision Number: Document Location:
Are at least one duplicate, on blank, and one standard or spike included with a given analytical batch?		x	
Briefly describe the laboratory's use of data derived from blank analyses:			
Are criteria established to determine whether blank data is acceptable?			

How frequently and at what concentration ranges does the lab perform duplicate analysis? What constitutes an acceptable agreement?

Please describe how the lab uses data obtained from spiked samples, including the acceptance criteria (e.g., acceptable percent recovery).

Question	Yes	No	Comments
Does the laboratory routinely include samples of reference material within an analytical batch?			
If yes, indicate frequency, level, & material Used			
Are mid-range standards included in analytical batches?			
Please describe the frequency, level, and compound used in the comments section.			
Are criteria for real time quality control established that are based on results obtained for the mid-range standards discussed above?			
If yes, briefly discuss them in the comments section or indicate the documentation in which they can be found:			
Are appropriate acceptance criteria for each type of analysis documented?			

c) Laboratory Preventative Maintenance

Question	Yes	No	Comments
For laboratory equipment, who has the responsibility for performing preventative maintenance?	Rite Weight services the balance and weights		
Is most maintenance performed in the lab?	x		
Is a maintenance log maintained for each major laboratory instrument?		x	
Are service contracts in place for major analytical instruments?		x	

d) Laboratory Record Keeping

Question	Yes	No	Comments
Are all samples that are received by the laboratory logged in?	x		
If appropriate, is sample shipping temperature recorded upon arrival?			
Discuss sample routing and special needs for analysis (or attach a copy of the latest SOP which covers this). Attach a flow chart if possible.			
Are log books kept for all analytical laboratory instruments?	x		
Are there log books or other records that indicate the checks made on materials and instruments such as weights, humidity indicators, balances, and thermometers?	x		
Are log books maintained to track the preparation of filters for the field?	x		
1. Are they current?	x		
2. Do they indicate proper use of conditioning?	x		
3. Weighings?			
4. Stamping and numbering?			
Are log books kept which track filters returning from the field for analysis?	x		
How are date records from the laboratory archived?	Stored in log books		
1. Where?	In the air monitoring lab.		
2. Who has the responsibility? Title?	Erin Jackson-Manager		
3. How long are records kept?			
Does a chain-of-custody procedure exist for laboratory samples?			Title & Date: Revision Number: Location:

e) Laboratory Data Acquisition and Handling

Question	Yes	No	Comments
Identify those laboratory instruments which make use of computer interfaces directly to record data. Which ones use strip charts? Integrators?	All continuous instruments.		
Are QC data readily available to the analyst during a given analytical run?		x	
What is the laboratory's capability with regard to data recovery? In case of problems, can they recapture data or are they dependent on computer operations? Discuss briefly.	All continuous data is polled by Airvsion and stored on a server that has SQL. All servers are backed up nightly.		
Has a user's manual been prepared for the automated data acquisition instrumentation?			

Please provide below a data flow diagram which establishes, by a short summary flow chart: transcriptions, validations, and reporting format changes the data goes through before being released by the laboratory.

f) Specific Pollutants: Particulate Matter

High Vol PM_{10}			
Question	**Yes**	**No**	**Comments**
Does the agency use filters supplied by EPA?	x		
Do filters meet the specifications in 40 CFR 50?	x		
Are filters visually inspected for defects before exposure?	x		
Where does the laboratory keep records of the serial numbers of filters?	PM10 logbook		
Are the temperature and humidity monitors calibrated?	x		
Are balances checked with Class S or Class M weights each day when they are used?	x		Class 1
To what sensitivity are filter weights recorded?			
What method of documentation is used to record filter weighing sessions? (e.g., logbook, computer software, etc.)	logbook		
During conditioning, are the following true:			
(1) Filters equilibrate for a minimum of 24 hours	X		
(2) The temperature range is from 15°C-30°C	x		
(3) Temperature control is ±3°C SD over 24 hrs	x		
(4) Humidity range is 20% - 45% RH	x		
(5) Humidity control is ± 5% SD over 24 hrs	x		
(6) Pre/post sampling RH difference in 24-hr means is ≤± 5% RH	x		
(7) Balance is located in the conditioning environment		x	
Are filters packaged for protection while transporting to and from the monitoring stations?	x		
Are filters shipped at ambient temperature to the monitoring stations?	x		
Are filters shipped at ambient temperature from the field to the laboratory?	x		
Are exposed filters reconditioned for at least 24 hrs in the same conditioning environment as for unexposed filters?	x		
Briefly describe how exposed filters are prepared for conditioning			
Briefly describe how exposed filters are stored after being weighed			
Are blank filters reweighed?		x	
Are chemical analyses performed on filters?		x	
If yes, what analysis is performed?			
$PM_{10-2.5}$/ Low Vol PM_{10}/ $PM_{2.5}$			

Question	Yes	No	Comments
Does the agency use filters supplied by EPA?	x		
Do filters meet the specifications in 40 CFR 50?			
Are filters visually inspected via strong light from a view box for defects before exposure?			
Where does the laboratory keep records of the serial numbers of filters?	Calendars, COC's, logbook		
Are temperature and humidity monitors calibrated?			Contract Lab
Are balances checked with Class 1 weights each day when they are used?			Contract Lab
To what sensitivity are filter weights recorded?	Contract Lab		
What method of documentation is used to record filter weighing sessions? (e.g., logbook, computer software, etc.)	Contract Lab		
During conditioning, are the following true:			
(1) Filters equilibrate for a minimum of 24 hours	x		
(2) The temperature range is 20°C-23°C for the 24-hr mean	x		
(3) Temperature control is ±2°C SD over 24 hrs	x		
(4) Humidity range is 30%-40% RH for 24-hr mean OR ≤5% sampling RH but >20% RH	x		
(5) Humidity control is ± 5% SD over 24 hrs	x		
(6) Pre/post sampling RH difference in 24-hr means is ≤± 5% RH	x		
(7) Balance is located in the conditioning environment	x		
Are filters packaged for protection while transporting to and from the monitoring stations?	x		
Are filters shipped at ambient temperature to the monitoring stations?	x		
Are filters shipped at ≤ 4°C from the field to the laboratory?	x		
Are filters post-weighed in ≤30 days?	x		
Are filters post-weighed in ≤10 days if they arrive >4°C?	x		
Are exposed filters reconditioned for at least 24 hrs in the same conditioning environment as for unexposed filters?	x		
Briefly describe how exposed filters are prepared for conditioning	Contract Lab		
Briefly describe how exposed filters are stored after being weighed	Contract Lab		
Are blank filters reweighed?			
Are chemical analyses performed on filters?		x	
If yes, what analysis is performed?			

Lead			
Question	**Yes**	**No**	**Comments**
Does the agency use filters supplied by EPA?			
Is analysis for lead being conducted using atomic absorption spectrometry with air acetylene flame?			
If not, has the agency received an equivalency designation for their procedure?			
Is either the hot acid or ultrasonic extraction procedure being followed precisely?			Which?
Is Class A borosilicate glassware used throughout the analysis?			
Is all glassware cleaned with detergent, soaked and rinsed three times with distilled or deionized water?			
If extracted samples are stored, are linear polyethylene bottles used?			
Are all batches of glass fiber filters tested for background lead content?			
At a rate of 20 to 30 random filters per batch of 500 or greater?			Indicate Rate -
Are ACS reagent grand HNO_3 and HCl used in the analysis?			
Is a calibration curve available having concentrations that cover the linear absorption range of the atomic absorption instrumentation?			
Is the stability of the calibration curve checked by alternately re-measuring every 10^{th} sample a concentration # 1Φg Pb/ml; # 10 Φg Pb/ml?			

END OF REPORT